

# Selection for Resistance to *Mycoleptodiscus* in Red Clover and Trefoil

R.R. Smith and C.R. Grau

## Introduction

Soilborne plant pathogens are regarded as important causes of failures of newly established and mature stands of forage legumes in the North Central Region of the U.S. The fungus *Mycoleptodiscus terrestris* was recovered from decaying roots and stems of birdsfoot trefoil (*Lotus corniculatus* L.) plants sampled from two-year-old plants in 1994. Although recognized in states south of Wisconsin, *M. terrestris* has not been implicated in poor health of forage legumes in Wisconsin. *M. terrestris* has been previously reported to be pathogenic on alfalfa (*Medicago sativa* L.), red clover (*Trifolium pratense* L.), and birdsfoot trefoil in Illinois. The fungus has been reported to be pathogenic on birdsfoot trefoil in Missouri and eastern U.S. Only the trefoil cultivar Dawn and the germplasm CAD have been reported to have some degree of resistance (tolerance) to *M. terrestris*. However, no resistance has been identified in trefoil or red clover germplasm adapted to the northern area of the midwest. Forage legume germplasm has not been characterized extensively for reaction to *M. terrestris*. Our goal was to attempt to select birdsfoot trefoil and red clover plants with the resistant reaction to *M. terrestris* using recurrent phenotypic selection.

## Materials and Methods

Selection was initiated simultaneously in four populations of birdsfoot trefoil. These populations were derived from Wisconsin germplasm, Minnesota germplasm (provided by Dr. Nancy Ehlke), New York germplasm (provided by Dr. Don Viands), and Nova Scotia germplasm (provided by Dr. Yousef Papadopoulos). The initial red clover germplasm was a composite of the cultivars Arlington and Marathon and selected breeding lines from the USDA/ARS program in Wisconsin. Ten-day-old seedlings established in vermiculite in plastic pans were inoculated with a *M. terrestris* mycelium drench using isolates derived from Wisconsin soils or plants grown in Wisconsin. Inoculated plants were maintained at 25°C for 14 days before removing from the

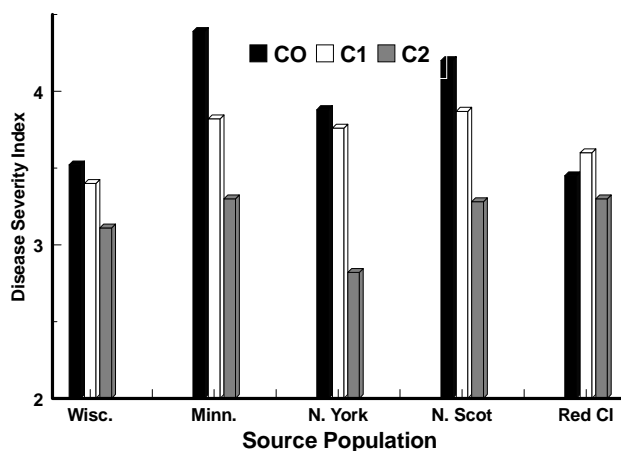


Figure 1. Response to two cycles of selection in trefoil and red clover for resistance to *Mycoleptodiscus terrestris*.

vermiculite and evaluated for disease reaction. Plants were evaluated on a scale of 1 = no necrosis, symptomless to 5 = severely necrotic or dead. Plants with a Disease Severity Index (DSI) of 1 were intercrossed to provide progeny for the next cycle of selection. Two cycles were completed. Seed was harvested by plant in the first cycle of selection in the red clover population and half-sib progeny evaluated to provide an estimate of broad sense heritability. An equal number of first cycle plants representing each of the four trefoil populations were intercrossed to provide half-sib progeny to estimate broad sense heritability among the trefoil populations.

## Results

Slight but significant progress from selection has been realized in each of the trefoil populations (Fig. 1). In red clover, however, the first cycle of selection was not effective, but a response was realized in the subsequent cycle. After two cycles of selection 42, 39, 52, and 38% of the trefoil plants express the resistant reaction in the Wisconsin, Minnesota, New York and Nova Scotia populations, respectively (Table 1). Thirty-one percent of the red clover plants express resistance. Broad sense heritability estimates were 24 and 21% for birdsfoot trefoil and red clover, respectively.

Table 1. Distribution of trefoil and red clover plants by Disease Severity Index (DSI).

Population	Cycle	Percent plants with DSI of			Mean	Probable Difference
		1 and 2	3	4 and 5		
<u>Trefoil</u>						
Wisconsin	C0	20	12	68	3.52	
	C2	42	18	40	3.11	> 0.10
Minnesota	C0	12	10	77	4.39	
	C2	39	12	48	3.30	> 0.01
New York	C0	18	18	64	3.88	
	C2	52	17	34	2.82	> 0.07
Nova Scotia	C0	15	13	72	4.20	
	C2	38	18	44	3.28	> 0.04
<u>Red Clover</u>						
Composite	C0	16	33	51	3.45	
	C2	31	29	40	3.13	> 0.10

DSI scale: 1 = resistant, 5 = susceptible/dead

## Conclusions

1. Two cycles of recurrent phenotypic selection for resistance to *M. terrestris* in birdsfoot trefoil and red clover has been effective.
2. Selection is continuing in all populations to increase the level of resistance. Resistance to this pathogen will improve overall plant health and should aid seedling establishment especially when soil moisture and temperatures are high.